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PATENT APPLICATION

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IN THE

UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Krishna A. BHARAT et al.

Confirmation No.: 8878

Application No.: 09/418,418

Examiner: B. N. To

Filing Date: 10/15/1999

Group Art Unit: 2172

Title: **METHOD FOR RANKING HYPertext SEARCH RESULTS BY ANALYSIS OF HYPERLINKS FROM EXPERT DOCUMENTS AND KEYWORD SCOPE**

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TRANSMITTAL OF APPEAL BRIEFTransmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on 11/17/2005.

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) \$500.00.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

(a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d)) for the total number of months checked below:

1st Month
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3rd Month
\$1020

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The extension fee has already been filed in this application.

(b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellants:	Krishna A. BHARAT et al.	§	Confirmation No.:	8878
Serial No.:	09/418,418	§	Group Art Unit:	2172
Filed:	10/15/1999	§	Examiner:	B. N. To
For:	Method For Ranking Hypertext Search Results By Analysis Of Hyperlinks From Expert Documents And Keyword Scope	§	Docket No.:	200308296-1

APPEAL BRIEF

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 Commissioner for Patents
 PO Box 1450
 Alexandria, VA 22313-1450

Date: January 27, 2006

Sir:

In Response to the Notice of Panel Decision from Pre-Appeal Brief Review dated December 27, 2005, Appellants hereby submit this Appeal Brief in connection with the above-identified application. A Notice of Appeal was filed via facsimile on November 17, 2005.

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Reply to Notice of Panel Decision from
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I. REAL PARTY IN INTEREST

The real party in interest is the Hewlett-Packard Development Company (HPDC), a Texas Limited Partnership, having its principal place of business in Houston, Texas, through its merger with Compaq Computer Corporation (CCC) which owned Compaq Information Technologies Group, L.P. (CITG). The assignment from the CCC to CITG was recorded on November 16, 2001, at Reel/Frame 012305/0944. The Change of Name Document was recorded on May 12, 2004, at Reel/Frame 014628/0103.

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II. RELATED APPEALS AND INTERFERENCES

Appellants are unaware of any related appeals or interferences.

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III. STATUS OF THE CLAIMS

Originally filed claims: 1-21.
Claim cancellations: 13.
Added claims: 22-23.
Presently pending claims: 1-12 and 14-23.
Presently appealed claims: 1-12 and 14-23.

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IV. STATUS OF THE AMENDMENTS

No claims were amended after the final Office action dated October 5, 2005.

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V. SUMMARY OF THE CLAIMED SUBJECT MATTER

The present invention relates to searching a database having a large number of documents, e.g., the WWW, for documents relating to a subject or query submitted by a user. See page 1, lines 5-6.

The invention is a solution to a problem caused by the fact that the WWW contains an extremely large number of documents. Conventional search engines based on searching for a given topic may require excessive amounts of time and computer resources to actually search the entire content of the web to identify documents related to a submitted topic when that topic is submitted. They also have difficulty in filtering out documents which are of low quality, i.e., after identifying the set of documents relevant to the topic identifying those that are experts. See page 1, lines 9-15.

The present invention reduces the time and effort required to provide a ranked list of good documents related to a query after the query is submitted by breaking the process into two broad phases, (a) first expert lookup and (b) secondly target ranking. See page 4, lines 1-2. The **first phase**, expert lookup, may be performed **before any search query is received**, i.e., in a preprocessing step, because it does not use any topic to identify experts. See page 4, lines 4-8, page 6, lines 23-25, and step 202 in Fig. 2(a). The **second phase** is a topic-based search which occurs **only after receipt of a topic based query** and searches only the expert documents from the first phase and documents to which selected experts point. See page 4, lines 9-17, page 6, lines 25-29 and steps 206, 208 of Fig. 2(a). The search of the expert documents after receipt of a topic-based query is dramatically simplified because the list of expert documents is dramatically smaller than all the documents on the WWW.

Figs. 3(a) and 3(b) provide alternative methods for determining expert pages which is the first phase of the invention. These methods are described in the specification beginning at page 8, line 24 through page 9, line 9. The list of expert pages is created **without reference to a topic**. The process for identifying experts is **based on factors other than specific topics**.

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The first phase may also include indexing of the expert list by topics to create an expert reverse index. See Fig. 4 and the specification at page 9, line 11 through page 10, line 9. If used, this step occurs after the experts have been identified, but before a topic based query is received.

The second phase begins when a topic-based query is received. The second phase does not search the entire WWW. Instead, the second phase uses the submitted topic to rank the expert documents that were previously identified in the first phase and form a subset of the expert documents. See Fig. 8 and the specification at page 10, line 11, through page 11, line 19. As with known topic based ranking methods, documents which do not have any, or not enough, key phrases matching the query topic receive a low or zero ranking, which is equivalent to being deleted or removed from the subset created by the ranking process. This step therefore results in a small subset of the expert documents from the first phase that are related to the query topic.

The second phase then includes ranking target documents identified, i.e., pointed to, by the small subset of expert documents identified above as relating to the topic. See Fig. 9 and the specification at page 11, line 21 through page 13, line 2. The target document set is dramatically smaller than the set of all documents on the web which may include the query topic. But the target documents are qualified by having been identified, pointed to, by the expert documents that (a) were identified in the first phase of the process and (b) have been ranked as relating to the topic-based query. As with known topic based ranking processes, the documents which receive low scores are deleted and not included in the list returned in response to the query.

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VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The following grounds for rejection are as stated in the Office action of 04/21/2005, which was referenced in the final Office action of 10/05/2005 for a statement of the rejections.

Whether claims 1, 20 and 21-23 are patentable under 35 U.S.C. § 103(a) over Chakrabarti et al. (Automatic resource compilation by analyzing hyperlink structure and associated Text April 14, 1998) in view of Page (U.S. Patent No. 6,285,999 B1). Claims 15-18 are also discussed under this ground for rejection and presumably covered by it.

Whether claims 5-10 and 19 are patentable under 35 U.S.C. § 103(a) over Chakrabarti et al. (Automatic resource compilation by analyzing hyperlink structure and associated Text April 14, 1998) further in view of Page (U.S. Patent No. 6,285,999 B1) and further in view of Yu (U.S. Patent No. 6,167,552).

Whether claims 11-12 are patentable under 35 U.S.C. § 103(a) over Chakrabarti et al. (Automatic resource compilation by analyzing hyperlink structure and associated Text April 14, 1998) in view of Page (U.S. Patent No. 6,285,999 B1) in view of Chakrabarti (U.S. Patent No. 4,418,433).

Claim 14 is not specifically discussed under any of the grounds for rejection and it is not clear which applies.

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VII. ARGUMENT

A. Rejection of claims 1, 20 and 21-23 under 35 U.S.C. 103(a) over Chakrabarti et al. (Automatic resource compilation by analyzing hyperlink structure and associated Text April 14, 1998) in view of Page (U.S. Patent No. 6,285,999 B1).

1. Claims 1, 20, and 21

Regarding claims 1, 20, and 21, the independent claims, the Examiner alleges that Chakrabarti teaches:

ranking the expert documents in accordance with the search query by hub score;
ranking target documents pointed to by the ranked expert documents (authority page and ranking page); and
returning a results list based on the ranked expert documents.

The Examiner notes that Chakrabarti does not explicitly teach forming a set of expert documents from the set of all hypertext documents crawled without reference to the search query, but asserts that Page discloses forming a set of expert documents from the set of all hypertext documents crawled without reference to the search query (col. 2, lines 51-54).

The Examiner then asserts that it would have been obvious to include crawling and ranking the crawled documents based on the measure of importance into Chakrabarti in order to organize relevancy of documents in the world wide web to assist the user in the search process.

The Appellants disagree with the Examiner's interpretations of Chakrabarti and Page. The Appellants submit that there is no suggestion in the either reference to combine the references. The Appellants submit that no combination of the references would result in a system that would make the present invention obvious.

As noted by the Examiner, Chakrabarti does not teach forming a set of experts from all documents searched without reference to a search topic. In fact, Chakrabarti does not teach forming a set of experts at all. Chakrabarti only teaches ranking of subsets of documents that are produced in topic based searches, i.e., ranking documents that relate to a particular topic. To do that,

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Chakrabarti necessarily starts with a topic based search.

As described in Section 2, Algorithm, Chakrabarti starts his process by submitting a topic to a term based search engine, in this case AltaVista. That is, Chakrabarti starts his process after receiving a query with search terms. From this search, Chakrabarti obtains a root set of about 200 documents containing the topic term(s). The root set is augmented by adding all documents that point to the root set and those that are pointed to by the root set. Augmenting is done twice to include all documents within a link distance of two. In Section 2.2, Chakrabarti suggests that multiple augmented sets for various topics may be stored. Chakrabarti also states that the principal bottleneck in his process will be crawling the web and extracting all the root and augmented sets. Chakrabarti, in essence, teaches forming a topic based subdivision or index of the WWW.

Chakrabarti in Section 1.1 notes that the use of linking to rank documents is known. Chakrabarti then teaches various prior art link based algorithms that he uses to build his specific link based ranking system. In Section 2, Chakrabarti discloses his specific linked based ranking system that he uses to rank the augmented sets previously produced, i.e., sets already limited to a particular topic. In this description, Chakrabarti describes modifications made "so as to maintain the focus on the topic." He notes further that the mechanism described in Section 2.1 assumes "that this topic-dependent link weighting has been done."

Therefore, all of the searching and ranking taught by Chakrabarti includes or is based on a specific topic, i.e., a search query. Chakrabarti never teaches forming a set of expert documents from all hypertext documents without reference to a search query. Chakrabarti does not teach ranking expert documents, but instead ranking a topic based subset of documents. Chakrabarti returns a set of ranked documents based on his augmented set that includes documents pointing to his root set, the root set itself, and documents pointed to by the root set. Chakrabarti does not teach returning a results list based on the ranked target documents, that would correspond to a portion of, but not all of, his augmented list.

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Page teaches a particular algorithm for assigning nodes in a link based database. Ranking is link based, as discussed above with reference to Chakrabarti. The portion of Page cited by the Examiner, col. 2, lines 51-54, merely states that the invention is based on use of the linked structure of a database to assign a rank to each document. As noted in the following sentence, col. 2, lines 54-57, this is in addition to determining relevance based on the intrinsic content and the anchor text, both of which are topic based. Thus, Page does not teach ranking all documents crawled without reference to a search query. Page teaches an improvement to topic based searching.

At col. 7, lines 37-55, Page teaches an implementation in which a user's homepage and/or bookmarks are given a large initial importance. This indicates to the system that the homepage and/or bookmarks contain subjects, i.e., topics, of high importance. This trains the system to recognize pages related to the person's interests, i.e., certain topics. Thus, Page teaches ranking documents that have already been grouped based on topics, not ranking without reference to the topic.

At col. 8, lines 6-20, Page teaches another application in which "a web crawler explores the web and creates an index of the web content, as well as a directed graph of nodes corresponding to the structure of hyperlinks. The nodes of the graph (i.e., pages of the web) are then ranked according to importance as described above in connection with various exemplary embodiments of the present invention." Thus, the teaching of Page is essentially the same as the teachings of Chakrabarti, i.e., after forming a subset of web documents based on a topic, a link based ranking system is used to rank the subset of documents.

Thus, neither Chakrabarti nor Page teach forming a set of expert documents from the set of all hypertext documents crawled without reference to the search query. Therefore, no combination of Chakrabarti and Page could teach forming a set of expert documents from the set of all hypertext documents crawled without reference to the search query.

In claims 1, 20 and 21, a set of expert documents is first formed without

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reference to a topic or search query. In the second step, the expert documents are ranked based on the search query. Then, target documents pointed to by the ranked experts are ranked and results based on the ranking of the target documents are returned. Since neither Chakrabarti nor Page teach forming a set of expert documents without reference to a search query, they cannot teach ranking a set of expert documents formed without reference to a topic or search query.

No combination of Chakrabarti and Page could teach such a process, since they both start with topic based searches. The only reasonable combination of Chakrabarti and Page would be to substitute Page's specific link based ranking system for the ranking system taught by Chakrabarti. That ranking system is used to rank a topic based subset of documents.

The processes of Chakrabarti and Page are similar to and possibly could be substituted for the second phase of the present invention. If the set of experts created in the first phase of the present invention is considered to be the entire database to be searched, then the processes of Chakrabarti and Page would produce a ranked list in response to a query similar to the present invention. However, Chakrabarti and Page do not teach forming such an expert subset and instead teach only starting with the entire database, e.g., the WWW. And, the processes of Chakrabarti and Page are more complicated, e.g., including documents linked by a link distance of two in both directions, than those used in the second phase of the present invention. By using the first phase of the present invention, the second phase may be simplified, e.g., by including only documents pointed to by the expert document, i.e., link distance of one in one direction.

Several advantages of the presently claimed Invention illustrate the substantial differences from the references. As noted in the preceding sentence, the second phase may be simplified as compared to the references reducing the time and resources used to produce a ranked list after receipt of a query. As noted by Chakrabarti, the main bottleneck in its process is crawling the web and extracting the root and augmented sets. Since Chakrabarti starts with a topic, the

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process cannot begin until the query, i.e., the topic, is received. In the present invention, the first step of forming a set of expert documents can be performed at any time prior to receipt of a query, since it is performed "without reference to the search query." In one embodiment, this step would be performed at a time when the computer resources and the Internet are not otherwise in heavy use. For example, this step could be performed once a day, e.g., during the night or early morning hours. The resulting expert set could then be used each time a search query is received later in the day without having to crawl the entire web again. This process improves the efficiency of use of available computer resources and reduces the time between receipt of a search query and returning a results list to the requestor.

In view of these substantial differences, the Appellants submit that the independent Claims 1, 20 and 21 are patentable over the prior art. Since the remaining claims are all dependent claims which further limit Claim 1, the Appellants submit that the dependent claims are also patentable over the prior art.

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B. Conclusion

For the reasons stated above, Appellants respectfully submit that the Examiner erred in rejecting all pending claims. It is believed that no extensions of time or fees are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 C.F.R. § 1.136(a), and any fees required (including fees for net addition of claims) are hereby authorized to be charged to Hewlett-Packard Development Company's Deposit Account No. 08-2025.

Respectfully submitted,

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VIII. CLAIMS APPENDIX

1. (Previously presented) A computer-implemented method for searching a large number of hypertext documents in accordance with a search query, comprising:
 - forming a set of expert documents from the set of all hypertext documents crawled without reference to the search query;
 - ranking the expert documents in accordance with the search query;
 - ranking target documents pointed to by the ranked expert documents; and
 - returning a results list based on the ranked target documents.
2. (Original) The computer-implemented method of claim 1, wherein the hypertext documents are pages in the world wide web.
3. (Original) The computer-implemented method of claim 1, wherein the hypertext documents are sites in the world wide web.
4. (Original) The computer-implemented method of claim 1, wherein the hypertext documents are documents in a hypertext database.
5. (Original) The computer-implemented method of claim 1, wherein an expert reverse index is constructed in memory for keywords appearing in the expert documents, the expert reverse index identifying the location of the keywords in the expert documents.
6. (Original) The computer-implemented method of claim 5, wherein a keyword of an expert document is included in the expert reverse index if the keyword is part of a key phrase that qualifies at least one URL in the expert document.

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7. (Original) The computer-implemented method of claim 6, wherein a key phrase qualifies a URL if the URL is within the scope of the key phrase in the expert document.
8. (Original) The computer-implemented method of claim 6, wherein a key phrase in an HTML title qualifies all URLs in the entire document.
9. (Original) The computer-implemented method of claim 6, wherein a key phrase in an HTML heading qualifies all URLs in that portion of the document before a next HTML heading in the document of greater or equal importance.
10. (Original) The computer-implemented method of claim 6, wherein a key phrase in an HTML anchor qualifies the URLs in the anchor.
11. (Previously presented) The computer-implemented method of claim 1, wherein forming a set of expert documents includes:
determining a document having at least a predetermined number of outlinks to be an expert document if the document also points to at least the predetermined number of targets on distinct non-affiliated hosts.
12. (Original) The computer-implemented method of claim 11, wherein expert documents additionally must point to documents that share the same broad classification.
13. (Canceled).

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14. (Original) The computer-implemented method of claim 1, wherein ranking target documents pointed to by the expert documents includes:

determining a plurality of edge scores for each target document, where an edge score is determined for edges between the expert documents and the target document;

determining a target score in accordance with the edge scores of the target document;

ranking the target documents in accordance with the target scores.

15. (Previously presented) The computer-implemented method of claim 14, further including:

determining an edge score only for those links to the target document from a predetermined number of top-ranked expert documents.

16. (Original) The computer-implemented method of claim 14, further including selecting target documents to be ranked that are linked to by at least two mutually non-affiliated selected expert documents, where the selected target also is not affiliated with the expert documents.

17. (Original) The computer-implemented method of claim 14, where an edge score between an expert document and a target document $ES(E,T)$ is determined as follows, where $ExpertScore$ reflects the rankings of the expert documents:

- a) find #occurrences of each keyword in all keyphrases of expert document E
- b) if the #occurrences for any keyword in E is 0: $ES(E,T)=0$
else $ES(E,T)=ExpertScore(E) * \text{sum of #occurrences for all keywords.}$

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18. (Original) The computer-implemented method of claim 14, wherein, if two affiliated experts have edges to the same target, the edge having a lower edge score is discarded and is not used to determine the target score.
19. (Previously presented) The computer-implemented method of claim 18, wherein two hypertext documents are affiliated if at least one of the following is true: 1) they share the same rightmost non-generic suffix and 2) they have an IP address in common.
20. (Previously presented) An apparatus that searches a large number of hypertext documents in accordance with a search query, comprising:
 - a software portion configured to form a set of expert documents from the set of all documents crawled without reference to the search query;
 - a software portion configured to rank the expert documents in accordance with the search query;
 - a software portion configured to rank target documents pointed to by the ranked expert documents; and
 - a software portion configured to return a results list based on the ranked target documents.
21. (Previously presented) A computer program product, comprising:
 - a computer usable medium having computer readable instructions stored therein to search a large number of hypertext documents in accordance with a search query, including:
 - computer readable program code devices for causing a computer to form a set of expert documents from the set of all documents crawled without reference to the search query;
 - computer readable program code devices for causing a computer to rank the expert documents in accordance with the search query;

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computer readable program code devices for causing a computer to rank target documents pointed to by the ranked expert documents; and

computer readable program code devices for causing a computer to return a results list based on the ranked target documents.

22. (Previously presented) The computer-implemented method of claim 1, wherein ranking the expert documents in accordance with the search query comprises:

determining a level score for each of the expert documents;

determining a fullness factor for each key phrase on each of the expert documents; and

determining an expert score for each expert document in accordance with the level score of the expert document and the fullness factors for the key phrases of the expert document.

23. (Previously presented) The computer-implemented method of claim 1, forming a set of expert documents occurs before a search query is received.

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IX. EVIDENCE APPENDIX

None.

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X. RELATED PROCEEDINGS APPENDIX

None.